PRELIMINARY DRAFT

Preliminary Environmental Review
Proposed Permit Modification
Champion International
(Revised January 1984)

In September of 1983 the Water Quality Bureau, DHES prepared a Preliminary Environmental Review (PER) on the proposed modification of an existing waste discharge permit for Champion International. That document summarized the conclusion reached following our review of the technical data but contained a minimal amount of the information utilized during our evaluation. During the public review process it became apparent that people were concerned as to whether adequate data existed to conduct such an evaluation. In an attempt to answer that question and to respond to questions and issues raised during the public review process we have significantly revised the original PER.

The decision presently before the agency is whether the current permit (MT-0000035), re-issued in October of 1982 should be revised to allow direct discharge of treated wastewater to the Clark Fork River at times other than during spring runoff. As such the environmental review required under the Montana Environmental Policy Act (MEPA) is limited to the potential impact of the modification rather than the impact of the entire wastewater disposal system. Champion International currently has a valid wastewater discharge permit which allows them to dispose of their treated wastewater into the river until October of 1987. The company is authorized to discharge in accordance with the conditions of that current permit.

The majority of comments received during the public review process were relative to long term impacts from the existing wastewater disposal system rather than the impact associated with the proposed modification. While the revised PER concentrates on issues surrounding the impacts of the proposed permit modification we have attempted to answer as many of the questions raised as we can with available information. While most of the comments could not be supported by scientific documentation it is obvious that people as far downstream as Idaho are concerned with possible downstream impacts.

Based on these concerns, the State of Montana will be expanding monitoring efforts in the lower Clark Fork River. We will also coordinate our efforts with the State of Idaho in an attempt to provide answers to these questions. This additional monitoring as outlined in the PER will be initiated regardless of the decision to modify or not modify the current permit. Champion International may be asked to support a portion of the additional monitoring effort.

In summary we feel this document provides a good assessment of the potential impacts of the proposed permit modification. Considerable time and effort has gone into our review and the development of this document. We feel it puts us in a position to make a decision that will provide adequate water quality protection of a valuable water resource.

PRELIMINARY DRAFT

ALLOWABLE DISCHARGES

Table 1 shows theoretically allowable discharge flows for Champion based on the formula $Qd=(1/Cd)\ (5Qr - 0.1855\ Sc)$. In the formula, Qd = allowable discharge flow in cubic feet per second (cfs), Cd = discharge color in standard color units (SCU), Qr = Clark Fork River flow in cfs, Sc = color (in lb/day) contributed to river from pond seepage and rapid infiltration, and 0.1855 is the conversion factor to convert lb/day into cfs-SCU. The formula assumes a linear dilution of color in the river, imposes the 5 SCU instream color standard, and makes an allowance for the contribution to river color from seepage by subtracting that amount from the allowable 5 units by dilution.

The calculated discharge flow values in Table 1 are conservative; that is, they exceed the actual amounts that Champion will be able to discharge in real situations. A summation of the values in Table 1 would indicate Champion could direct discharge almost 76% of its produced wastewater. In actuality, they will be able to direct discharge only about 40%. This is true because of the following: 1. In adjusting discharge flows to meet the 5-unit instream color standard, Champion will have to operate at about 4 units river color change on the average in order to have a reasonable factor of safety to prevent numerous swings in river color change above 5 units. This alone will result in actual discharge flows being 20 % less than theoretical. 2. During very high river flows, adverse hydraulic head prevents Champion from discharging all the volume that they would be theoretically allowed and hence they lose the ability to take full advantage of those high flows. 3. At times when high river flows are present, Champion may not happen to have sufficiently full ponds to discharge a correspondingly high volume of effluent. In response to all these effects, actual direct discharge flows will average only about 53% of those calculated.

However, during lower river flows (i.e., average August and September flows when the river would supposedly be under most stress), even the theoretically allowable discharge flows would be diluted at more than 1000 to 1 in the river. This is because the seepage contribution of color is taking up most of the allowable 5 unit increase in the river.

Table 1

Projected Champion Mean Monthly Discharge
Levels Based On River Mean Monthly Flows

Monthly Mean Discharges 1930-79 Period of Record

Flow** Month	River Flow Mean (CFS)*	Champion Discharge
October	2800	4.7
November	2800	4.7
December	2570	3.6
January	2270	2.1
February	2490	3.2
March	3060	6.0
April	6430	22.9
May	15400	67.7
June	17500	78.2
July	6030	20.9
August	2300	2.2
September	2290	2.2

*Waltermeyer and Shields, 1982

**calculated allowable discharge flow

assumptions 1. direct discharge color = 1000 SCU
2. seepage color input = 50,000 lb/day constant

SELF-MONITORING HISTORY FOR COLOR VIOLATIONS
1980-1983

Table 2 presents a summary of self-monitoring data submitted to the Department by Champion International during the past 4 years, 1980-1983, which could be interpreted to show a possible violation of the river color standard of 5 Standard Color Units (SCU) increase between the upstream and downstream sampling points. It should be emphasized that the two sampling points were set up in order to show the total in-river color increase as a result of the three types of discharge at Champion; i.e., the continuous contribution to river color from (1) seepage and (2) rapid infiltration of waste, and (3) the seasonal contribution from direct surface discharge of waste.

Because of differences in discharge permit requirements between the two MPDES permits covering the period, the apparent violations of standards from each year will be discussed separately. The 1978 permit controlled discharges until the issuance of the currently effective permit in November, 1982. The 1978 permit contained limitations on the amount of direct discharge, the most stringent of which was a formula based upon color dilution in the river intended to maintain the 5 unit instream increase color standard.

In 1980, as in previous years, Champion chose to control their direct discharge flows by adjusting the flows to maintain a 5 SCU or less color increase in the river. They accomplished this by a series of instream color measurements coupled with any necessary flow adjustments throughout each day. Champion still performed the other required checks with regard to bioassay, BOD, TSS, pH, etc., but these were always met easily in the process of meeting the color standard.

Table 2 shows that there were 13 <u>possible</u> color standard violations during 1980. These are viewed as apparent (or <u>possible</u>) water quality standard violations because they represent the <u>minimum</u> of the daily values sampled at the upstream station (Harpers) subtracted from the <u>maximum</u> of the daily values sampled at the downstream station (Six Mile). On only one day in 1980 (5/11/80) did the difference exceed 5 color units on an <u>average</u> basis, when a 5.4 unit difference was recorded. Because the apparent standard violations were comparisons of maximum vs. minimum values and the fact that the permit condition required only that the discharge formula be met, which it was, no enforcement action was taken.

In 1981 there were 48 apparent color standard violations during direct discharge and 6 apparent color standard violations during no discharge. In 1981 Champion changed their discharge control approach to sampling their discharge and the upstream river station for color, then adjusting their discharge flow as per the permit condition formula $D = \frac{Q(5)}{C_d-(C_r+5)}$ where D is the rate of discharge in cfs, Q is the river flow in cfs, C_d is the color of the discharge in SCU, and C_r is the background color of the river in SCU. Champion also sampled downstream river color at the Six Mile station on a daily basis so the instream color change could be checked.

Results of this type of control coupled with the daily upstream-downstream color sampling in 1981 showed rather conclusively that the dilution formula condition in the 1978 permit was inadequate to achieve

the 5 SCU color standard, apparently because the seepage contribution to instream color wasn't adequately taken into account. It was obvious at that point that a change in the permit was necessary, so the condition was added in the "permission for direct discharge" letter for the 1982 direct discharge season that Champion must adjust their discharge flow to meet the 5 SCU instream color standard. The letter also informed them that, upon renewal of the permit, the formula would be removed in favor of the instream monitoring condition.

Under Section 75-5-103(5) of the Water Quality Act (the definition of pollution),"... A discharge, seepage, drainage, infiltration or flow which is authorized under the pollution discharge permit rules of the board is not pollution under this chapter." Because of the foregoing section and the fact that Champion had discharged in 1981 according to permit conditions under the color formula, we concluded that a formal enforcement action against Champion for the apparent violation of the water quality color standard was not the best method for accomplishing our goal of compliance with the Water Quality Standards.

In 1982, according to the condition imposed by the 1982 "permission for direct discharge" letter, Champion was required to adjust their discharge to meet the instream color standard. Table 2 shows that there were 12 apparent color violations during 1982. Here again, the method of reporting causes some uncertainty as to what constitutes a violation. The values listed for 1982 represent those times when the daily maximum color reading at Six Mile (downstream station) exceeded the average reading at Harpers Bridge (upstream station) by more than 5 SCU. This means that there could have been a violation that day based on a given set of upstream-downstream observations. However, when averages are compared, only one violation, at 7 SCU on 4/17/82, occurred. That day Champion ceased direct discharging when discovering the violation and did not resume until 4/19/83. The Water Quality Bureau determined that the 1982 violations were not significant enough to warrant enforcement action.

In 1983, reporting and discharging situations were similar to 1982, with one violation at 6 SCU average occurring during the non-discharge season (2/9/83) and one violation at 6 SCU average occurring on 4/30/83 during direct discharge. The maximum-minus-average format showed 17 apparent violations in 1983. No enforcement action was taken in 1983. In 1983 the discharge was governed by the current or 1982 permit, wherein Champion was required to regulate the combined discharge to meet the 5 SCU instream color standard.

As a possible resolution to the problem of interpretation of self-monitoring data on instream river color, the WQB intends to require that self-monitoring reports include all river color sample results with associated sample times. This will enable the Bureau to compare upstream-downstream river sample results on a paired basis. Instream river sampling is still difficult to interpret, due to varying travel times of waste in the river between sampling points, possible non-representative sampling in the large river cross section, varying input from seepage and other nonpoint sources, and natural instream fluctuations. However, the WQB feels that control through instream sampling is still the best way to insure compliance with the instream water quality standard for color.

Table 2

Summary of

Champion International Color Violations

1980-1983

Note:

1980 direct discharge

dates: 4/19 -7/12

Date	Max (Six Mile) minus Min (Harpers)	Avg (Six Mile) minus Avg (Harpers)
4-29-80	6 SCU	4 SCU
5-11-80	8 SCU	5.4 SCU
5-14-80	7 SCU	5 SCU
5-16-80	19 SCU	4 SCU
5-25-80	13 SCU	2 SCU
5-28-80	6 SCU	5 SCU
5-31-80	6 SCU	5 SCU
6-2-80	6 SCU	4 SCU
6-5-80	6 SCU	4 SCU
7-2-80	12 SCU	5 SCU
7-3-80	7 SCU	2 SCU
7-4-80	7 SCU	3 SCU
7-6-80	6 SCU	5 SCU

Table 2 cont.

Note: 1981 direct discharge

dates: 3/18, 3/30-6/18

Date	Max (Six Mile) Minus Min (Harpers)	Avg (Six Mile) minus Avg (Harpers)	
3-19-81	9 SCU	5 SCU	
3-28-81	8 SCU	5 SCU	
3-30-81	6 SCU	4 SCU	
4-3-81		8 SCU	only 1 sample
4-4-81		8 SCU	only 1 sample
4-5-81		8 SCU	only 1 sample
4-6-81		7 SCU	only 1 sample
4-7-81		7 SCU	only 1 sample
4-8-81		7 SCU	only 1 sample
4-9-81		9 SCU	only 1 sample
4-10-81		8 SCU	only 1 sample
4-11-81		9 SCU	only 1 sample
4-12-81		9 SCU	only 1 sample
4-13-81		8 SCU	only 1 sample
4-14-81		10 SCU	only 1 sample
4-15-81		9 SCU	only 1 sample
4-16-81		9 SCU	only 1 sample
4-17-81		8 SCU	only 1 sample
4-18-81		8 SCU	only 1 sample
4-19-81		6 SCU	only 1 sample

Table 2 cont.

Date	Max (Six Mile minus Min (Harpers)	Avg (Six Mile) minus Avg (Harpers)	
4-20-81		7 SCU	only 1 sample
4-21-81		7 SCU	only 1 sample
4-22-81		9 SCU	only 1 sample
4-23-81		7 SCU	only 1 sample
4-24-81		8 SCU	only 1 sample
4-26-81		8 SCU	only 1 sample
4-27-81		8 SCU	only 1 sample
4-28-81		8 SCU	only 1 sample
4-29-81		7 SCU	only 1 sample
4-30-81		8 SCU	only 1 sample
5-4-81		6 SCU	only 1 sample
5-6-81		6 SCU	only 1 sample
5-7-81		8 SCU	only 1 sample
5-10-81		7 SCU	only 1 sample
5-11-81		6 SCU	only 1 sample
5-12-81		7 SCU	only 1 sample
5-13-81		7 SCU	only 1 sample
5-14-81		8 SCU	only 1 sample
5-15-81		7 SCU	only 1 sample

Table 2 cont.

Date	Max (Six Mile) minus Min (Harpers)	Avg (Six Mile) Minus Avg (Harpers)	
5-17-81		6 SCU	only 1 sample
5-19-81		9 SCU	only 1 sample
5-20-81		6 SCU	only 1 sample
5-22-81		6 SCU	only 1 sample
			5/22-24 extremely high river flow
5-23-81		8 SCU	only 1 sample
5-24-81		20 SCU	only 1 sample
5-25-81		6 SCU	only 1 sample
6-1-81		6 SCU	only 1 sample
6-3-81		6 SCU	only 1 sample
7-18-81		6 SCU	only 1 sample
7-26-81		9 SCU	only 1 sample
8-1-81	6 SCU	5 SCU	
	Max (Six Mile) minus Avg (Harpers)	**Avg (Six Mile) minus Avg (Harpers)**	
8-29-81		6 SCU	
9-9-81	6 SCU	4 SCU	
9-16-81	6 SCU	5 SCU	

Table 2 Co .

Note: 1982 direct

discharge dates: 4/12 - 7/14

Shut off on 4/17 due to

river color Resume 4/19

Date	Max (Six Mile) minus Avg (Harpers)	Avg (Six Mile) minus Avg (Harpers)
4-16-82	6 SCU	5 SCU
4-17-82	13 SCU	7 SCU
4-22-82	6 SCU	4 SCU
5-3-82	6 SCU	4 SCU
5-5-82	6 SCU	4 SCU
5-6-82	6 SCU	5 SCU
5-11-82	6 SCU	5 SCU
5-18-82	8 SCU	5 SCU
5-22-82	8 SCU	4 SCU
5-27-82	7 SCU	5 SCU
6-8-82	6 SCU	4 SCU

Table 2 co-

Note: 1983 direct

discharge dates:

3/14, 3/15, 4/23-7/14

Date	Max (Six Mile) minus Min (Harpers)	Avg (Six Mile) minus Avg (Harpers)
6-15-82	6 SCU	5 SCU
2-9-83	6 SCU	6 SCU
3-15-83	7 SCU	4 SCU
4-27-83	6 SCU	4 SCU
4-30-83	6 SCU	6 SCU
5-12-83	6 SCU	5 SCU
5-18-83	6 SCU	5 SCU
5-27-83	6 SCU	5 SCU
5-28-83	6 SCU	5 SCU
6-1-83	8 SCU	5 SCU
6-4-83	7 SCU	5 SCU
6-6-83	6 SCU	5 SCU
6-12-83	7 SCU	5 SCU
6-18-83	7 SCU	5 SCU
6-21-83	7 SCU	3 SCU
6-23-83	6 SCU	4 SCU
6-24-83	8 SCU	5 SCU
7-11-83	6 SCU	2 SCU

The Water Quality Bureau has also requested and received the paired upstream-downstream color sample data (Table 3) from Champion in order to compare them to the summary of data (Table 2) that was compiled by the Water Quality Bureau from previous self-monitoring reports. As can be seen by comparing the two tables, the paired observations verify how maximum-minimum values from several pairs of samples each day can indicate unrealistically large "apparent" violations of the color standard. In 1980, 1982 and 1983, where more than one set of paired color samples was taken per day, the number of actual days that exceedences of the color standard occurred was reduced from the apparent 49 to 34. More importantly, the magnitude of color change never exceeded 8 units in the paired samples, and reached 8 on only 4 days.

Table 3 also verifies the statements previously made about uncontrollable changes in instream river color at the upstream sampling station, but shows that in spite of the difficulties, a fairly good degree of river protection can be maintained by instream sampling and concurrent adjustment of the discharge flow.

TABLE 3

CLARK FORK RIVER COLOR

Date	Harper's (SCU)	Six-Mile (SCU)	Difference (SCU)
4-29-80	18	23	5
	17	21	4
5-11-80	21	27	6
	19	25	6
	21	25	4
5-14-80	16	23	7
	16	18	2
5-16-80	2	6	4
	17	21	4
5-25-80	26	34	8
	21	17	-4
5-28-80	32	38	6
	32	36	4
5-31-80	21	26	5
	20	25	5
6-02-80	19	25	6
	23	24	1
6-05-80	24	30	6
	24	26	2
7-02-80	11	17	6
	5	9	4
7-03-80	12	13	1
	6	8	2
7-04-80	9	11	2
	13	16	3
7-06-80	6	12	6
	6	9	3
3-19-81	7	15	8
	7	12	5
	6	10	4
3-28-81	10	13	3
	8	16	8
	8	12	4
3-30-81	8	12	4
	9	14	5
8-01-81	6	12	6
	2	6	4
9-09-81	7	12	5
	4	8	4
9-16-81	6	11	5
	4	8	4

TABLE 3 Continued

CLARK FORK RIVER COLOR

Date	Harper's (SCU)	Six-Mile (SCU)	Difference (SCU)
4-27-83	15	18	3
	15	21	6
	18	22	4
4-30-83	11	17	6
	11	17	6
	12	17	5
5-12-83	12	19	7
	12	17	5
	14	19	5
5-18-83	13	19	6
	13	17	4
5-27-83	26	30	4
	28	33	5
5-28-83	29	35	6
	30	37	7
	33	36	3
	33	36	3
6-01-83	27	33	6
	23	26	3
6-04-83	18	24	6
	16	21	5
6-06-83	16	20	4
	16	22	6
6-12-83	18	24	6
	19	25	6
	19	22	3
	18	21	3
6-18-83	11	18	7
	11	14	3
6-21-83	12	18	6
	10	16	6
	11	14	3
6-23-83	11	14	3
	13	18	5
6-24-83	11	18	7
	10	14	4
	9	14	5
7-11-83	20	22	2
	29	30	1

TABLE 3 Continued

CLARK FORK RIVER COLOR

Date	Harper's (SCU)	Six-Mile (SCU)	Difference (SCU)
4-16-82	21	27	6
	20	25	5
4-17-82	16	23	7
	7	13	6
	7	13	6
	12	18	6
4-22-82	11	15	4
	10	13	3
	10	16	6
	9	15	6
5-03-82	30	34	4
	27	29	2
	19	22	3
	28	31	3
5-05-82	31	35	4
	29	31	2
	28	34	4
5-06-82	25	29	4
	25	31	6
5-11-82	19	24	5
	18	22	6
5-18-82	28	36	8
	29	31	2
	28	31	3
5-22-82	16	18	2
	20	26	6
5-27-82	31	34	3
	30	34	4
	30	37	7
6-08-82	15	18	3
	16	19	3
	16	22	6
6-15-82	28	34	6
	29	34	5
	30	35	5
2-09-83	4	10	6
	3	9	6
3-15-83	20	23	3
	12	17	5

TOTAL SUSPENDED SOLIDS

The proposed permit decreases the allowable mean monthly and daily maximum concentrations of total suspended solids (TSS) from 240 to 162 mg/l and from 360 to 312 mg/l, respectively. The proposed permit allows a doubling of the allowable total yearly load of TSS from 2 million pounds to 4 million pounds.

Table 4 compares the actual and added loads of TSS. The total calculated yearly natural or background TSS load at Clark Fork, Idaho is 232 million pounds. The yearly TSS load increase of 2 million pounds would cause increases of 0.4% and 0.8% in the natural TSS loads in the Clark Fork River below the discharge and at Clark Fork, Idaho (if it all reached this point), respectively. The largest increase (at the discharge point), based on monthly mean values would be 1.7%. The worst case or the largest increase would occur when instream TSS was very low, the stream flow to discharge flow ratio was 200:1, and the discharge TSS concentration was at its maximum permitted value of 312 mg/l. An example of very low TSS instream (2 mg/l) occurred in April, 1982. Using this value and the assumptions above, the proposed discharge would have increased the instream TSS concentration to 3.5 mg/l.

Under the existing permit 100% of the allowed annual load of 2 million pounds of TSS is discharged in the direct discharge period which usually starts in April and ends in July. The proposed permit will allow continuous direct discharge but over 85% of the direct discharge water will still be discharged in the same time period (during spring runoff, Table 4).

Table 4. Mean monthly tons of background total suspended solids (TSS) in the Clark Fork River and additional TSS resulting from the proposed discharge

	Clark Fork River above discharge Mean Monthly		Direct Discharge Mean Monthly			% Increase
	Flow (cfs) *	TSS (tons/month)	Flow (cfs) **	TSS (tons/month) ***	*****	
October	2800	2790	4.7	63.7	43.9	1.5
November	2800	2700	4.7	63.7	43.9	1.6
December	2570	2770	3.6	47.2	32.5	1.1
January	2270	1860	2.1	28.5	19.7	1.1
February	2490	1820	3.2	39.2	27	1.5
March	3060	3317	6.0	81.4	56.1	1.7
April	6430	14460	22.9	300.5	207	1.4
May	15400	87141	67.7	918	633	0.7
June	17500	105870	78.2	1026	708	0.7
July	6030	13082	20.9	283.4	195	1.5
August	2300	1860	2.2	29.8	20.5	1.1
September	2290	1800	2.2	29.8	20.5	1.1
Sum (tons)		237796		2911.2	2006.6	
Sum (pounds)		475×10^6		5.8×10^6 ****	4×10^6	

*Waltermeyer and Shields, 1982
**based on meeting color standard
***based on 162 mg/l TSS monthly average concentration
****exceeds yearly load limit
*****reduced by .69 so the total TSS = total maximum allowable yearly load of 4.0×10^6 pounds

There are three possible instream impacts of increases in TSS: 1. The increased TSS could settle on the stream bed and physically interfere with the biota; 2. The increased TSS could cause short or long term toxicity; and 3. The increased TSS could reduce the concentration of dissolved oxygen. These three possibilities will be discussed in order.

In the kraft mill effluents which have been examined, 80 to 95% of the TSS are bacteria or bacterial fragments (ncasi 1978A, 1978B, 1978C). These particles are very small, with a specific gravity near 1, and form colloidal suspensions (ncasi, 1978B) thus many of these particles remain in suspension indefinitely, even in quiescent ponds. The proposed permit includes a requirement that the effluent be held in ponds for at least 10 days after treatment, to allow for settling of the larger particles to occur.

One of the factors which reduces settling is agitation or turbulence. Because the turbulence in the Clark Fork River and probably even in its reservoirs is greater than in the ponds at the plant, it is reasonable to assume that TSS which won't settle in 10 days in a pond won't settle in the stream or its reservoirs. Sludge deposits have not been found at the stream sites below pulp mills which have biological treatment (ncasi, 1978B). In fact, such deposits have not been reported below any treated pulp mill effluent in the Pacific Northwest (Dan Bodien, technical expert on pulp and paper mill wastewater treatment, US EPA, Region 10, Seattle, Wash., personal communication, December 30, 1983).

Because these TSS are primarily biological particles, they serve as a food source for stream insects and actually increase the secondary productivity of experimental streams (ncasi 1978B, 1978D, 1982). This also indicates that deposition on the stream bed is unlikely.

Toxicity resulting from these TSS is very unlikely as bioassays performed using whole effluent and rainbow trout (more than 150 bioassays, from 1975 through 1982) indicate that usually more than one half of the fish exposed to 100% effluent survived for more than 96 hours; that is, the 96 hr. LC50 exceeded 100% effluent (unpublished data, WQB files). In addition life cycle bioassay using microcrustaceans in 1983 indicated no toxicity with 100% effluent (unpublished data, WQB files). These results were with 100% effluent. The proposed permit requires a dilution of at least 200 to 1 so the chance of short term toxicity instream is remote. A literature survey by Davis (1976) indicated that for all salmonid species tested the average sublethal threshold concentration was 0.16 of the 96 hr. LC 50 and ranged from 0.006 to 0.33 of the 96 hr. LC 50. The responses at the sublethal threshold concentration inclued changes in growth rate, "cough" frequency, avoidance behavior and blood chemistry, in other words a measurable effect. This indicates that at a dilution of 200 to 1 or at 0.005 of the 96 hr. LC 50 (which is required in order to meet the instream color standard) there should be no measurable effect on fish in the Clark Fork River.

If these TSS accumulated instream they could increase the solubility of heavy metals through pH effects and result in increased toxicity. However, as mentioned previously, these TSS will not accumulate.

The effects of TSS on dissolved oxygen concentrations could be either due to an accumulation of this material and its resultant localized oxygen demand or to its relatively constant oxygen demand throughout the receiving water. As has already been pointed, out the possibility of this material accumulating instream is remote. Because of the small volume, rapid turnover rate (0.05 to 2 days) and thus relatively high turbulence in Thompson Falls Reservoir, settling is also very unlikely to occur in this reservoir. Settling in Noxon Rapids Reservoir is possible as the turnover time is considerably longer (from 1.9 to 78 days, United States Geological Survey data, WQB calculations). However, because the effluent will have 10 days in relatively quiescent ponds for settling to occur and because the remaining material forms a colloid, it is unlikely that significant settling will occur. In addition one study, which used radioactive carbon to trace TSS from the treated effluent of a boxboard manufacturing plant in a stream, indicated about 20 - 25% of the TSS was oxidized or assimilated in the receiving stream in less than 5 days. This work was done during September, 1977 in New York State (ncasi, 1978D). It is not possible to directly compare the composition of the benthic community in the Clark Fork River to the one in New York. However the same types of filterfeeding organisms are apparently very abundant in both streams. Community respiration (a measure of total oxidation) did not change by more than an order of magnitude from winter to summer in the aquatic habitats examined by Odum (1956). Community respiration changes by about one order of magnitude from summer to winter in both the Flathead and Kootenai Rivers (Jack Stanford, Director, Yellow Bay Biological Station, Big Fork, Montana, January 10, 1984.). During low flow the estimated times of flow from the discharge are: to Thompson Falls Reservoir, 3.4 days; to Thompson Falls Reservoir discharge, 5.4 days; to Noxon Reservoir, 6.9 days; to Noxon Dam discharge, 85 days; to Cabinet Gorge Dam discharge, 89 days (volume of Cabinet Gorge reservoir provided by Washington Water Power, volume of other reservoirs from USGS, calculations made by WQB staff). Thus during September (using the 25% in 5 days rate of the stream in the New York study and applying it to the Clark Fork River) over 99% of the TSS discharged by the paper mill would probably be oxidized or assimilated before reaching Cabinet Gorge Dam. Of course as the flows increase the travel times decrease but the load of natural TSS increases. This will mask the effects of the discharged TSS at high flows. The rate of oxidation and/or assimilation could be lower at lower winter temperatures. However, according to Odum (1956) and Stanford (see above) it would probably still take less than 5 days to respire (oxidize) 2.5% of the TSS. If it did take 5 days or less to oxidize and/or assimilate 2.5% of the TSS, during the winter, then during low flow about 67% of the discharged TSS could reach Lake Pend Oreille.

BIOCHEMICAL OXYGEN DEMAND

The proposed permit decreases the allowable mean monthly and daily maximum concentrations of biochemical oxygen demand (BOD) from 120 to 87 mg/l, and from 180 to 161 mg/l respectively. The total allowable yearly load is decreased from 2.25 to 2.1 million pounds per year. The proposed permit does allow a change in the distribution of this load throughout the year. BOD as addressed in the permit, is based on a 5 day test. Thus the ultimate or complete BOD is greater than the permit limits. The few tests done on the proposed discharge indicate the ultimate BOD is about 4 X the reported BOD (unpublished data, WQB files). Ultimate BOD is usually approximately equivalent to the chemical oxygen demand (COD) (American Public Health Association, 1979). There are very limited data on the BOD of the Clark Fork River, especially for the

recent past; that is after sewage treatment improvements at Missoula in 1976 and inception of wastewater treatment at the Kraft mill in 1974. There are COD data (in the STORET* system) for the USGS station just above the mill and for the Idaho Department of Health and Welfare Station at Clark Fork, Idaho. The yearly COD load above the mill is about 267 million pounds and the mean concentration is 20 mg/l. At Clark Fork Idaho the yearly COD load is 404 million pounds and the mean concentration is 8.7 mg/l. The approximate yearly COD load from the proposed discharge is 8.4 million pounds and the approximate average concentration is 348 mg/l. After the 200 to 1 dilution required to meet the color limit the discharge would increase the average instream COD from 20 mg/l to about 20.6 mg/l. Thus based on yearly average the proposed discharge could lower the instream dissolved oxygen (DO)concentration by about 0.6 mg/l in total or by 0.15 mg/l in five days (COD of $0.6/4 = BOD_5$) if there were no reaeration or photosynthesis in the stream. Table 5 shows the background and COD increases based on monthly average values.

A study done for Champion International by CH2M Hill (1983) which projected the impacts of year round discharge on dissolved oxygen concluded that the concentration of dissolved oxygen would be lowered by a maximum of 0.11 mg/l in August. This value is substantiated by WQB calculations and the fact the

*National Water Quality Data base maintained by US EPA

Table 5 Mean monthly tons of background Chemical Oxygen Demand (COD) in the Clark Fork River and additional COD resulting from the proposed discharge.

	Clark Fork River above discharge Mean Monthly Flow (cfs) *	COD (tons/month)	Direct Discharge Mean Monthly Flow (cfs) ***	COD(tons/month) ****	*****	% Increase
October	2800	2578	4.7	137	92	3.6
November	2800	2268	4.7	133	89	3.9
December	2570	1936	3.6	105	70	5.4
January	2270	3800**	2.1	61	41	1.1
February	2490	4424	3.2	84	56	1.3
March	3060	5122**	6.0	175	117	2.3
April	6430	9375	22.9	646	433	4.6
May	15400	39.958	67.7	1972	1321	3.3
June	17500	28,350**	78.2	2204	1477	5.2
July	6030	6561	20.9	609	408	6.2
August	2300	3850**	2.2	64	43	1.1
September	2290	11871	2.2	62	42	0.4
Sum (tons)		120093		6252.2	4189	
Sum (pounds)		$240.X\ 10^6$		$12.50\ X\ 10^6$		

*Waltermeyer and Shields, 1982
**no monthly data, used yearly mean concentration value
***based on meeting color standard
****based on BOD limit of 87 mg/l and BOD X 4 = COD
*****reduced by .67 so that total BOD = total maximum allowable yearly load of $2.1\ X\ 10^6$ pounds

recorded DO depressions during discharge periods and during low flow periods have been in this range (Braico, 1973; Knudsen and Hill, 1978; US EPA, 1973). During low flow perods in the past the only discharge was through seepage. In order to comply with the color limitatons of the proposed permit direct discharge during low flow periods will be limited and most of the discharge will be through seepage (table 1). Although there have been no documented problems associated with BOD discharges and none are expected, it does appear that previous DO monitoring may not have been done far enough downstream to detect the maximum effect (CH2M Hill, 1983; WQB calculations, 1983). Thus sampling will be done during 1984 to determine the downstream point at which the maximum DO effect occurs. The permit requirement of stopping the direct discharge whenever DO concentration in the river is at or below 7 mg/l will be maintained, and if future monitoring shows the maximum depression to occur below the present monitoring point, then either the monitoring point will be changed or the shut off value will be increased.

PLUGGING OF RIVER BED

The factors causing plugging of the rapid infiltration (RI) basins are not well understood. Nevertheless, plugging of the river bed similar to what has happened in the RI basins is not expected because of the following differences: (1) waste in the RI basins is at full strength; it is diluted a minimum of 200 to 1 in the river; (2) the bottoms of the RI basins are anaerobic; the river bed is not, (3) the bottoms of the RI basins are undisturbed; the river bed is periodically disturbed; (4) the direction of flow into the bottom of the RI basins is always the same; the direction of flow into the river bed is not; (5) the amount of flow into the bottom of the RI basins is probably very large compared to the volume of flow into the bottom of the river.

TOXICITY FROM SCUM, FOAM AND CHLORINATED COMPOUNDS

The lack of toxicity of the effluent has already been discussed. This demonstrates that chlorinated compounds in the effluent are not present at toxic levels. It is possible that toxic organics could be concentrated in scum or foam. In order for toxicity to occur the fish would have to be exposed to an accumulation of this material. This exposure could occur through contact at the water surface during feeding or if the fish actually ate the material deliberately (highly unlikely) or accidently (possible). Thus exposure is possible, but the amount of exposure for those fish which are exposed is probably limited and most fish are likely not exposed at all. No effect of this material on fish has been documented. In fact, the relative abundance of foam above and below the discharge has not been documented. The section on monitoring describes the actions we will take to resolve the questions of foam abundance and toxicity.

NONDEGRADATION AND THE GOAL OF ZERO DISCHARGE OF POLLUTANTS

Nondegradation with regard to TSS applies only if adverse impacts will result. The surface water non-degradation rule defines "degradation" as follows:

> An applicable water quality standard for ... suspended solids ... has been violated.

There is no absolute quantifiable standard for TSS. Rather, the standards

use terms such as "creation of a nuisance"; rendering state waters "harmful, detrimental, or deleterious"; creating "acute or chronic problem levels"; forming "objectionable sludge deposits"; or creating conditions "which produce undesirable aquatic life." Thus if no adverse impacts result from the introduction of TSS, non-degradation does not apply. In this case the introduction of TSS will not cause such an adverse impact. The effects of TSS are discussed in the section on TSS.
The 1985 goal in the Clean Water Act of no discharge of pollutants is just that, a goal. It is not a requirement of the Clean Water Act.

INCREASED NUTRIENT LOAD

The production of algae in most waters is limited by one of two nutrients: nitrogen (N) or phosphorus (P). If the ratio of nitrogen to phosphorus is larger than 10, P is more likely to limit the growth of algae than N; if the ratio is less than 5, N is more likely limiting than P; if the ratio is between 5 and 10, a determination cannot be made (Zison et al., 1977).

Using nutrient data collected at Huson, Bahls and others (1979) reported that N was the nutrient limiting the growth of algae in the lower Clark Fork River. This was based on consistently low ratios (mean = 4) of total soluble inorganic nitrogen (TSIN) to ortho-phosphate, measured as mg/L N and P, respectively.

Mills and others (1982) suggest using total nitrogen (TN) instead of TSIN because certain algae can use either organic or inorganic nitrogen. And for this evaluation, we used total phosphorus (TP) instead of ortho-phosphate because:

1. All Champion P data are reported as total P;

2. Available instream P data for the selected baseline year (1981) is reported as total P; and

3. Phosphorus is rapidly transformed in aquatic systems to the more biologically available ortho-phosphate.

Ratios of TN to TP were calculated using water year 1980 and 1981 nutrient data recorded at the U.S. Geological Survey (USGS) Clark Fork River water quality station below Missoula (USGS, 1980 and 1981). TN to TP ratios for 19 sampling dates ranged from 4.5 to 77.0 (mean = 13.2), with no evident seasonal trends. These results indicate that either N or P may limit the growth of algae in the river downstream from the Champion mill and that potential additions of both nutrients should be assessed.

There is a relatively small amount of N and P in wood. Hence, large amounts of N and P need to be added to kraft mill wastewaters in order to promote biological treatment. From 1976 through 1982, Champion added an average of 160 lb/day N as ammonia and 80 lb/day P as phosphoric acid to their wastewater stream (Bill Henderson, pers. comm., December 19, 1983). However, Champion will need to increase these nutrient applicaton rates in order to meet the BOD limits set in the proposed discharge permit. Proposed nutrient application rates are 1000 lb/day N and 100 lb/day P, although these rates may be increased further, even doubled, in order to achieve the

targeted BOD concentration in the discharge (Larry Weeks, pers. comm., December 15, 1983 and Bill Henderson, pers. comm., December 21, 1983).

Average daily nutrient application rates in 1981 are given in Table 6, along with average nutrient concentrations in Champion ponds and test wells for that same year. In order to predict nutrient concentrations in the ponds and test wells at the increased application rates, it was assumed that residual concentrations of TN and TP in ponds and test wells are linearly proportional to application rates. These projected concentrations are also presented in Table 6.

Table 6 Actual (1981) and projected concentrations of TN and TP (mg/L) in ponds and test wells at different nutrient application rates.

Nutrient	Application Rate (lb/day)	Storage and Rapid Infiltration Ponds (mg/l)	Test Wells (mg/l)
TN	150 (1981)	1.74 (1981)	0.92 (1981)
	1000 (present)	11.70	6.16
	2000 (possible)	23.10	12.24
TP	40 (1981)	1.00 (1981)	0.75 (1981)
	100 (present)	2.50	1.88
	200 (possible)	5.00	3.75

Assumption: Residual concentrations of TN and TP in ponds and test wells are linearly proportional to nutrient application rates.

In contrast to lakes, where nutrient loading over time is critical, the best way to assess the eutrophication potential in rivers is to look at sustained instantaneous nutrient concentrations. Levels of N and P likely to cause obnoxious or nuisance growths of algae in rivers are listed in Table 7. Elsewhere, the U.S. Environmental Protection Agency has proposed 1.0 mg/l inorganic nitrogen and 0.1 mg/l total phosphorus as instream nutrient limits for avoiding excessive growths of algae (criteria matrix for 305b water quality severity analysis, Region 8, Denver).

Since the rate of algae growth is directly related to temperature, the assessment should be based on nutrient concentrations in the river in the warmest month of the year. Water temperatures in the Clark Fork River below Missoula are generally highest in August (Aagaard, 1969).

Actual and projected August concentrations of TN and TP in the Clark Fork River downstream from the Champion mill are presented in Table 8. These concentrations were calculated using a mass balance equation and the following data.

1. A mean August river flow of 2300 cfs at the USGS station below Missoula (Table 1).

2. A maximum allowable August direct discharge flow of 2.2 cfs (Table 1).

3. A constant seepage flow to the river of 14.9 cfs.

4. Nutrient concentrations based on the means of concentrations measured in the ponds and test wells in calendar year 1981 and in the river below Missoula in water years 1980 and 1981.

Table 7. Eutrophication potential in rivers as a function of nutrient concentrations (Mills *et al.*, 1982).

P (mg-P/L)	N (mg-N/L)	Dry Algal Cells (mg/L)	Significance
0.013	0.092	1.45	Problem threshold
0.13	0.92	14.5	Problem likely to exist
1.3	9.2	145.0	Severe problems possible

Table 8. Actual and projected concentrations of total nitrogen and total phosphorus (mg/L) in the Clark Fork River with the additions of Champion seepage and direct discharge in August at different nutrient application rates.

Nutrient	Application Rate (lb/day)	Below Missoula*	Add Seepage	Add Discharge
TN	150 (1981)	0.79	0.79	0.79
	1000 (present)	0.79	0.82	0.83
	2000 (possible)	0.79	0.86	0.88
TP	40 (1981)	0.06	0.06	0.06
	100 (present)	0.06	0.07	0.07
	200 (possible)	0.06	0.08	0.08

*Mean of 19 values measured in water years 1980 and 1981 at the U.S. Geological Survey water quality station (No. 12353000) downstream from Missoula (USGS, 1980 and 1981)

Assumptions: 1. Concentrations of nutrients in seepage and in direct discharge to the river equal concentrations in test wells and in storage and rapid infiltration ponds, respectively.

2. Seepage rate of 14.9 cfs.

3. Direct discharge rate of 2.2 cfs.

4. River flow of 2300 cfs at the USGS station below Missoula

Mean annual nutrient concentrations were used instead of August concentrations because there was no major seasonal trend, in the river or in the ponds and test wells. The 14.9 cfs seepage rate was estimated as 60 percent of the total 16 MGD Champion wastewater output (Larry Weeks, pers. comm., December 22, 1983). It is assumed that all of this seepage enters the river. The predicted concentrations in table 8 assumes that the concentrations of nutrients in seepage and in direct discharge to the river equal concentrations in test wells and in storage and rapid infiltration ponds, respectively.

Background concentrations of nutrients in the Clark Fork River upstream from the Champion mill already exceed the "problem threshold" level but fall short of the "problem likely to exist level". (Compare the numbers in Tables 7 and 8). With nutrient additions from Champion, instream nutrient concentrations would remain below EPA criteria for avoiding nuisance algae growths in flowing waters. The increase in algae production would parallel the increase in concentration of N or P, depending on which nutrient is limiting at the time.

Because of the assumptions used in projecting Champion nutrient additions to the Clark Fork River with increased nutrient applications, it is very unlikely that the concentrations predicted in Table 8 will be achieved. However, the Water Quality Bureau knows of no better way to predict these nutrient additions. Therefore, the Bureau is requiring Champion to monitor for nutrients in its discharge and in selected test wells. The Bureau also will conduct ambient monitoring for nutrients and other variables in late summer 1984. (See "ADDITIONAL MONITORING" section.)

FISH KILLS

Two fish kills in the Clark Fork River that may be attributed to pollutants released by the Champion facility have been documented since the mill began operating in 1957. The first occurred on or about July 31, 1958 when untreated wastewater was being discharged directly to the river (Averett, 1961; IPC, 1960; Spindler and Whitney, 1960). The second occurred on or about September 25, 1961 and involved only mature whitefish (IPC, 1963; Larry Weeks, pers. comm., December 19, 1983). The first fish kill occurred prior to any ponding of the wastewater; the second fish kill occurred after ponding but before construction of the primary clarifier (in 1970) and application of secondary treatment (in 1974).

Larry Weeks, technical director at the Frenchtown mill, was asked by the WQB if there have been any documented fish kills from pulp mill discharges after secondary treatment and, if so, what were the discharge limits and stream conditions? Mr. Weeks replied as follows:

"The West Coast Regional Center of the NCASI (National Council of the Paper Industry for Air and Stream Improvement) did not know of any documented fish kills due to pulp mill effluents with secondary treatment. Mr. Larry Patterson of the Oregon DEQ said that in the last 15 years, there have been no fish kills attributed to pulp mills along the Willamette and McKenzie Rivers. There are six pulp mills that discharge into these two rivers. Our Corporate office will canvas the East Coast" (Larry Weeks, written comm., December 22, 1983).

Slime (Periphyton) Growth

A natural feature of every river is an association of small, simple organisms that live attached or in close proximity to the stream bottom. In the Clark Fork River this periphyton community, commonly called "slime," is composed mostly of diatoms, soft-bodied green and blue-green algae, bacteria, fungi and protozoans. These organisms, particularly the algae, coat rocks and other substrates only down to the depth at which light is limiting.

The periphyton community is the principal site of primary production in small shallow rivers. As a river receives more flow and becomes deeper downstream, the periphyton community becomes less and less important as the source of primary production and the plankton (open water) community becomes more and more important. Even in the largest of Montana rivers, like the lower Clark Fork, periphyton organisms will completely cover rocks in shallow water near shore.

The Clark Fork River below Missoula is among the two or three most productive rivers in northwest Montana (Bahls et al., 1979). Thick mats of periphyton, predominantly algae, are common on rocks in shallow waters where there is at least some current. In the water these mats may take on many appearances, ranging from a rust-colored slimy coating characteristic of diatoms to a dark green miniature forest of many-branched filaments characteristic of mosses and certain multi-cellular algae. Removed from the water, these periphyton mats have a peculiar musty odor. When the water level drops in late summer and rocks with their attached organisms are exposed, the periphyton community becomes appressed to the surface of the rocks, turns a light gray or tan color, and peels and flakes off as it dries.

On November 23, 1983 a fisherman on the Clark Fork River east of Paradise found some material on some rocks along the river that he thought was "paper fibers from the Champion mill at Frenchtown" (Figure 2). He turned the material over to the Sanders County sanitarian, who in turn sent it to the Water Quality Bureau in Helena. Microscopic examination proved the material to be a dehydrated colony of Cladophora, a genus of filamentous green algae found throughout western Montana (Figure 3). The algae had many epiphytic diatoms still attached.

In light of this incident, there appears to be at least some confusion on the part of the public as to the nature and origin of observed biological deposits on the river bottom. Hence, the Bureau has been skeptical of reports of "sludge deposits," "slime," "slimy, viscous substances," "brown scum," "paper fibers" and the like, all attributed to the Champion operation at Frenchtown. The Bureau will search for mill-generated deposits next summer. (See "ADDITIONAL MONITORING" section.) Meanwhile, the Bureau will provide free microscopic examination and further analysis, if warranted, of any material from the river suspected to be from the mill discharge.

Biological Studies

Baseline biological conditions in the Clark Fork River before the Champion mill began operating are described in reports prepared by Spindler (1959) and the Institute of Paper Chemistry (1956 and 1957). Their findings may be summarized as follows:

1. Macroinvertebrate communitites at stations downstream from the present mill site contained predominantly immature stages of pollution sensitive insects (mayflies, stoneflies and caddisflies).

2. The river was heavily fertilized by raw sewage discharged at Missoula and the recovery zone extended downstream to St. Regis.

Reports addressing the effects of Champion mill operations on the biology of the Clark Fork River have been authored by Spindler and Whitney (1960), Averett (1961), Weisel (1972), the U.S. Environmental Protection Agency (1974), Knudson and Hill (1978), Bahls et al. (1979), and the Institute of Paper Chemistry (1958-1983). Their findings may be summarized as follows:

1. The Clark Fork River below Missoula is one of the most productive rivers in northwest Montana in terms of periphyton chlorophyll and biomass accrual.

2. The production of algae in the river below Champion is limited by the concentration of soluble inorganic nitrogen in the water; in other words, the river is nitrogen limited. It was later demonstrated that either nitrogen or phosphorus can be limiting - see INCREASED NUTRIENT LOAD section).

3. Concentrations of total soluble inorganic nitrogen in the river below Champion are below those required to produce nuisance algae growths.

4. Relatively low autotrophic index values (average = 121) indicate that the periphyton community below Champion is composed primarily of autotrophs (algae).

5. The algal flora below Champion is dominated by diatoms, which generate a large species diversity (Shannon diversity = 4.65).

6. The macroinvertebrate community below Champion is dominated by immature stages of facultative or pollution sensitive insects (mayflies, stoneflies, caddisflies and true flies--mostly of the family Simulidae) which generate a large genus diversity (Shannon diversity = 3.37).

7. Except for temporary and localized effects of mill operations, only very subtle differences in the composition and structure of macroinvertebrate communities have been recorded in the river from upstream to downstream of the mill;

    a. Differences in mean values for biological variables between control and experimental stations (Harper Bridge and Huson) were usually smaller than differences between replicate values at a single station.

    b. Some of these differences may be due to differences in substrate, current velocity, and other factors unrelated to Champion operations.

8. The river in the vicinity of the Champion mill is still recovering from the discharge of the Missoula wastewater treatment plant and the effects of this discharge appear to override and mask any general biological affects that may be attributed to the Champion operation.

Since 1976 the Montana Department of Health and Environmental Sciences has been gathering biological information from the Clark Fork River at several stations between Missoula and Superior. The following summarizes unpublished data collected at the Harper Bridge and Huson stations at times of low flow when Champion was not discharging directly to the river:

1. Mean periphyton diatom diversity was high (3.76 at Harper Bridge and 4.23 at Huson) and the diatom associations at both stations consisted of 60 to 80 percent intolerant taxa.

2. Mean periphyton chlorophyll accrual was 30 percent larger at Huson than at Harper Bridge, but mean biomass accrual was only 6 percent larger.

3. Mean autotrophic index decreased 18 percent between Harper Bridge and Huson, indicating a larger percentage of autotrophic (algal) production at the downstream station; the very low mean autotrophic index values at both stations (66 at Harper Bridge and 55 at Huson) indicated that the periphyton consisted almost entirely of algae.

4. There was no significant difference in total numbers, total taxa, species composition or structure of macroinvertebrate communities at the two stations: the macroinvertebrate fauna consisted mostly of immature stages of caddisflies and mayflies (80 to 90 percent) with smaller numbers of true flies (about 10 percent) and stoneflies (about 2 percent).

The State of Idaho Department of Health and Welfare gathered macroinvertebrate data in 1979 from a station at Clark Fork above Lake Pend Oreille. The results are summarized by Bauer (undated) as follows:

> Samples were collected from a deep run with a cobble substrate. The most numerous invertebrates were two species of mayfly, and one species of caddisfly. Calculated diversity index was high (2.41) indicating a healthy benthic community.

Additional macroinvertebrate data were gathered at the Clark Fork site in 1981 and 1982 and provided by the State of Idaho without interpretations. The 1981 data are comparable to the 1979 data, but data collected in 1982 indicate an impoverished fauna consisting only of 1 to 20 organisms and 1 to 3 taxa per sample. This may have been due to an unstable sand substrate (Gary Gaffney, pers. comm., December 15, 1983). The State of Idaho also provided periphyton chlorophyll and biomass data, which were gathered at the same station in 1980. These data were generated from natural substrate samples and are not comparable with data generated at Montana stations using artificial substrates (Stephen Bauer, pers. comm., December 13, 1983).

Fish population estimates for sections of the Clark Fork River upstream and downstream from the Champion mill were provided by the Monana Department of Fish, Wildlife and Parks and are presented in Table 9.

Table 9. Fish population estimates for sections of the Clark Fork River near Turah, below Milltown Dam and near Superior (Montana Department of Fish, Wildlife and Parks).

Location and year	Species	Length interval	Number estimate per mile
Turah - June, 1983	Brown	8.0-12.9	110
		13.0-15.9	80
		≥16.0	15
	Rainbow	7.0-13.9	101
Turah - July, 1982	Brown	8.0-12.9	173
		13.0-15.9	80
		≥16.0	26
	Rainbow	7.0-13.9	87
Turah - May, 1981	Brown	8.0-12.9	123
		13.0-15.9	93
		≥16.0	21
	Rainbow	7.0-13.9	105
Turah - July, 1980	Brown	8.0-12.9	136
		13.0-15.9	66
		≥16.0	17
	Rainbow	7.0-13.9	131
Turah - Oct., 1979	Brown	8.0-12.9	232
		13.0-15.9	49
		≥16.0	38
	Rainbow	7.0-13.9	312
Turah - Mar., 1979	Brown	8.0-12.9	88
		13.0-15.9	75
		≥16.0	49
	Rainbow	7.0-13.9	165
Milltown - Sept., 1980	Rainbow	6.0-9.9	74
		10.0-12.9	88
		≥13.0	47
	Brown	≥8.0	59
Milltown - May, 1983	Rainbow	6.0-9.9	390
		10.0-12.9	207
		≥13.0	88
	Brown	≥8.0	21
Superior - June, 1983	Rainbow	8.0-12.9	124
		13.0-15.9	82
		≥16.0	13
	Cutthroat	≥8.0	33

ADDITIONAL MONITORING

The following ambient monitoring will be performed in addition to that required in the permit.

Biological. Champion International plans to continue the annual biological surveys of the Clark Fork River that have been conducted by the Institute of Paper Chemistry since 1956 (IPC, 1956-1983). These surveys assess the structure and composition of benthic macroinvertebrate communities at 9 stations between Sherman Gulch and the I-90 bridge downstream from the mouth of Ninemile Creek. Surveys are routinely conducted in August--the month potentially most of stressful for aquatic life--and a report on each survey is completed the following year. Champion has agreed to forward one copy of all subsequent IPC biological survey reports to the Water Quality Bureau in Helena, where they will be available for public inspection (Larry Weeks, pers. comm., December 28, 1983).

The remaining monitoring described below will be conducted by Water Quality Bureau staff in 1984. Field work will be completed in late summer, preferably when lowest river flow coincides with highest river temperature, and when Champion is discharging directly to the river. Champion International may be asked to support a portion of this additional monitoring.

Benthic algae (periphyton) samples will be collected from natural substrates at Harper Bridge, a site one-half mile below the mill outfall, and at Huson (IPC stations 5, 7 and 10). Additional samples will be collected near Lozeau, St. Regis and Thompson Falls. The ecological impact of mill discharge and seepage at low river flows will be assessed using a diatom species pollution indicator approach developed by Lange-Bertalot (1979). This technique was successfully applied on the Clark Fork River by Bahls (In Press) to measure the relative environmental effects of Milltown Dam, the Missoula wastewater treatment plant, and Champion International (seepage and residual effects of direct discharge at high flows).

Dissolved Oxygen. Instream concentrations of dissolved oxygen will be measured concurrently within the hour before sunrise at the following locations on the Clark Fork River: Harper Bridge, Huson, Superior and Thompson Falls. The hour before sunrise is ordinarily the time of day during which the lowest concentration of dissolved oxygen is recorded. The BOD in treated effluents from kraft paper mills exerts its maximum effect on instream dissolved oxygen from one to three days transit time downstream (Dale Patterson, Wisconsin Department of Natural Resources, pers. comm., December 27, 1983). Superior and Thompson Falls are about one and three days river flow downstream from the Champion plant, respectively.

Foam. A procedure is available for measuring foaming tendency and foam stability in terms of equivalent concentrations of alkyl benzene sulfonate (ABS) (Carpenter and Gellman, 1967). Although it was developed for pulp and paper mill effluents, it can be used on natural waters and other types of effluents. Water and wastewater will be collected from the following locations and tested for foaming tendency and foam stability:

Clark Fork River above Missoula WWTP
Missoula WWTP effluent
Clark Fork River below Missoula WWTP
Bitterroot River near mouth
Clark Fork River at Harper Bridge
Champion International effluent (or pond water)
Clark Fork River at Huson
Clark Fork River at Superior
Flathead River near mouth
Clark Fork River at Thompson Falls
Clark Fork River at Noxon
Clark Fork River at Cabinet Gorge

Downriver Reconnaissance. An extensive survey of the lower Clark Fork River--from above Missoula to Cabinet Gorge Dam--will be conducted by trained biologists during late summer. Most of this reach will be traversed by power boat and selected points inaccessible by boat will be visited on foot or by on-road vehicle where access permits. The purpose of the survey will be to seek out and identify water quality problems that might be attributed to pollution sources upstream. Particular attention will be paid to backwaters and to conditions above and below dams. Personel will be instructed to make a thorough written and photographic record of their observations and to look particularly for the following:

-- foam
-- sludge deposits
-- slime growth
-- stained rocks
-- colored or cloudy water
-- foul-smelling water
-- wastewater discharges
-- dead or sickly fish

Foam will be collected and brought back to the laboratory and analyzed for constituent organic compounds, if feasible. Sludge deposits and slime growth will be collected and analyzed microscopically for constituent micro-organisms. The chlorophyll and biomass content of slime (periphyton) samples from along the river will be measured in order to determine the relative proportion of autotrophic and heterotrophic organisms. Sickly and recently dead fish will be collected and frozen for autopsy and possibly tissue analyses. Benthic macroinvertebrate samples will be collected with a kick net and scanned in the field for composition, abundance and diversity of aquatic insects as a quick biological indicator of overall water quality. Apparatus will be carried along to measure temperature, pH and dissolved oxygen and to detect hydrogen sulfide. A supply of sample bottles and preservatives will be included for sampling discharges and other sources of potential pollution.

Synoptic Water Quality Run. Water Quality Bureau field personnel will conduct an intensive water quality survey of the lower Clark Fork River in conjunction with the downriver reconnaisance described above. Samples will be collected at the same stations at which foam samples are collected and analyzed for the following constituents:

--TSS
--BOD
--COD
--DO
--color
--nutrients

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Figure 1. Upper line = median river flow

Lower line = average wastewater discharge flow

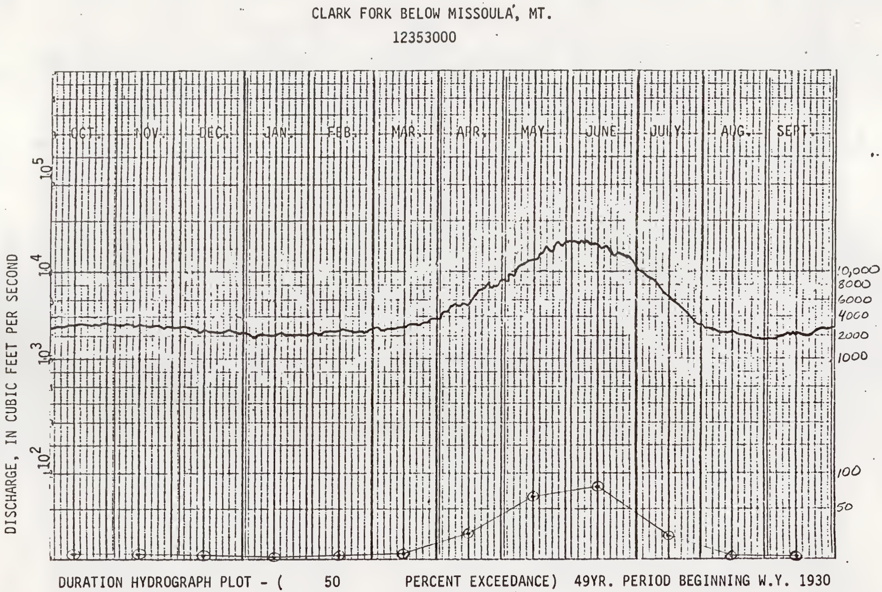

Figure 2. Material found by a fisherman on some rocks in the Clark Fork River east of Paradise on November 23, 1983.

Figure 3. A portion of the material pictured in Figure 2 magnified 32 times, showing individual filaments of the common green alga Cladophora.

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PRELIMINARY ENVIRONMENTAL REVIEW

Division/Bureau Department of Health and Environmental Sciences/Water Quality Bureau

Project or Application Champion International Frenchtown Mill- MPDES Permit MT-0000035

Description of Project

Request to modify permit to allow surface discharge to Clark Fork River at times other than during spring runoff, but still including spring runoff

POTENTIAL IMPACT ON PHYSICAL ENVIRONMENT

	Major	Moderate	Minor	None	Unknown	Comments on Attached Pages
1. Terrestrial & aquatic life and habitats			X			
2. Water quality, quantity and distribution			X			
3. Geology & soil quality, stability and moisture				X		
4. Vegetation cover, quantity and quality				X		
5. Aesthetics			X			
6. Air quality				X		
7. Unique, endangered, fragile, or limited environmental resources				X		
8. Demands on environmental resources of land, water, air & energy				X		
9. Historical and archaeological sites				X		

DHES/ESD-1

POTENTIAL IMPACTS ON HUMAN ENVIRONMENT

	Major	Moderate	Minor	None	Unknown	Comments on Attached Pages
1. Social structures and mores				X		
2. Cultural uniqueness and diversity				X		
3. Local and state tax base & tax revenue			X			
4. Agricultural or industrial production			X			
5. Human health				X		
6. Quantity and distribution of community and personal income			X			
7. Access to and quality of recreational and wilderness activities				X		
8. Quantity and distribution of employment			X			
9. Distribution and density of population and housing			X			
10. Demands for government services			X			
11. Industrial & commercial activity			X			
12. Demands for energy			X			
13. Locally adopted environmental plans & goals				X		
14. Transportation networks & traffic flows				X		

Other groups or agencies contacted or which may have overlapping jurisdiction DFWP ALSO SEE REFERENCE LIST

Individuals or groups contributing to this PER. Fred Shewman, WQB - Loren Bahls, WQB - Abe Horpestad, WQB -- ALSO SEE REFERENCE LIST

Recommendation concerning preparation of EIS None necessary - see attached comments

PER Prepared by: Fred Shewman, WQB - Loren Bahls, WQB -Abe Horpestad, WQB

Date: 9/83 (Revised 1/84)

DHES/ESD-2

Summary and Conclusions:

The expanded environmental review has revealed no area of significant environmental impacts and no further environmental review is recommended. The revised PER addresses the impact of those water quality parameters that would be affected by the proposed modification of the existing Champion International wastewater discharge permit. The most obvious impact would be in the yearly allowable increase in total suspended solids (TSS) which would increase by 2 million pounds. While that number seems significant it results in only a 0.4% increase above natural TSS loads in the Clark Fork River, an increase which would be difficult to measure accurately. Impacts to other parameters such as color, dissolved oxygen and others are even less significant.

Our review has indicated that the tentative permit would require some revision if the decision were made to modify the permit. These revisions would provide further control over the quality of wastewater being discharged and are shown below:

(1) Flow should be monitored by continuous recorder,

(2) Color monitoring should be by paired samples collected at least twice daily,

(3) Expiration date should be 18-24 months rather than 5 years as proposed,

(4) Monitoring for phosphorous and nitrogen should be increased,

(5) A minimum retention time in the storage ponds should be provided to maximize settling.

While available water quality information shows no significant impacts from Champion's existing wastewater disposal system enough concern has been expressed that the Department will initiate an expanded monitoring program as outlined in the PER. The monitoring program will be financially supported in part by Champion and will be coordinated with the Idaho Division of Environment. This monitoring will be initiated regardless of the decision on the proposed permit modification.

The results of this monitoring program would be utilized in any further review and reconsideration of a permit for this facility. A condition in the tentative permit requires that if river data shows a violation of water quality standards the permit will be modified to ensure compliance.

Champion International must recognize that further evaluation of treatment alternatives is necesssary and periodic meetings between the Department and Champion will be held to ensure that this is being done.